APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/507,542	02/18/2000	Joseph K. Davidson	P950	8012

7590 02/25/2004	EXAMINER
Daniel L Dawes	GARCIA OTERO, EDUARDO
Myers Dawes & Andras LLP	

ART UNIT	PAPER NUMBER
2123	

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DATE MAILED: 02/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.		Applicant(s)	
Office Action Summary	09/507,542		DAVIDSON ET AL.	
	Examiner		Art Unit	
	Eduardo Garcia-Otero		2123	

-- *The MAILING DATE of this communicati n appears n the c ver sh et with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 January 2004*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12,16-19 and 21-28* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12, 16-19, and 21-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

DETAILED ACTION: Final Action

Introduction

1. Title is: METHOD AND APPARATUS FOR GEOMETRIC VARIATIONS TO INTEGRATE PARAMETRIC COMPUTER AIDED DESIGN WITH TOLERANCE ANALYSIES AND OPTIMIZATION

2. First named inventor is: DAVIDSON

3. The pending claims are 1-12, 16-19, 21-28.

4. Applicant's Amendment received 1/29/04, amends claims 1, 6, 9, and 10, and adds new claims 25-28.

5. Applicant claims priority to U.S. Provisional application serial No. 60/120,961 filed Feb. 19, 1999.

Index

6. **Iannuzzi** refers to US Patent 5,586,052.

7. **Hoppe** refers to US Patent 6,137,492.

8. **Krishnamurthy** refers to US Patent 6,256,039.

9. **Ballas** refers to US Patent 4,800,652.

10. **Carlstrom** refers to US Patent 5,875,264.

11. **Rose** refers to US Patent 5,574,468.

12. **Kedem** refers to US Patent 4,649,498.

13. **Kamiguchi** refers to US Patent 5,549,857.

14. **Kandikjan** refers to "A mechanism for validating dimensioning and tolerancing schemes in CAD systems", by T. Kandikhan et. al., Computer-Aided Design 33 (2001) 721-737.

15. **Maxey** refers to New Riders' Reference Guide to AutoCAD 13, by Randall A. Maxey et. al., New Riders Publishing, 1995, ISBN 1-56205-237-3, pages 227-229 (DIM), pages 227-284 (DVIEW), 674-679 (TOLERANCE and parallelism).

16. **McGraw-Hill Dictionary** refers to The McGraw-Hill Dictionary of Scientific and Technical Terms, Sixth Edition, by McGraw-Hill Companies, Inc., ISBN 0-07-042313-X, 2003:

   - **barycentric coordinates** "The coefficients in the representation of a point in a simplex as a linear combination of the vertices of the simplex."

- **simplex** "An n-dimensional simplex in a Euclidean space consists of n + 1 linearly independent points... a triangle with its interior and a tetrahedron with its interior are examples."

Claim Interpretation

17. It appears efficient to discuss claim interpretation before addressing the Applicant's remarks.

18. Claim 1 (currently amended) explicitly appears to claim a 6 level logical or organizational hierarchical structure.

- OBJECT LEVEL. One or more objects.
- FEATURE LEVEL. Each object may contain one or more features.
- ZONE LEVEL. Each feature may contain one or more tolerance zones.
- FORM LEVEL. Each tolerance zone contains exactly one algebraic form and exactly one geometric form.
- MAP LEVEL. Each geometric form contains exactly one tolerance map.
- SUBMAP LEVEL. Each tolerance map may contain one or more submaps.

19. Note that each tolerance zone contains exactly one geometric form, and each geometric form contains exactly one tolerance map. Thus, each tolerance zone contains (indirectly) exactly one tolerance map.

20. In other words (from top down): there may be multiple objects, each object may have multiple features, each feature may have multiple tolerance zones, and each tolerance zone has exactly one tolerance map (indirectly) and may have multiple submaps (indirectly).

APPLICANT'S REMARKS

21. 35 USC 112 REJECTIONS. Remarks page 12 confusingly uses the term "parts", instead of the claim 1 terms "objects" or "features". It is not clear whether "parts" refers to "objects" or "features", or both.

22. Applicant appears to distinguish between the Tolerance Map of a single feature, in contrast to the "accumulation Tolerance Map" for stacked features. Remarks page 11 states "A primary function of Tolerance Maps (T-map) according to the present invention is to determine the accumulation of error in the stackup". Remarks page 12 states "when the two parts are put

together (stackup), their Tolerance Maps are combined (e.g. using the Minkowski sum) to generate a new Tolerance Map (i.e. the accumulation Tolerance Map).

23. However, claim 1 does not appear to address the issue of features stacking. Rather, merely stating "representing each tolerance zone for each geometric feature of said object... tolerance map".

24. Remarks page 13 states "If there are multiple variations specified on the same feature, then there are sub-Tolerance Maps (or submaps) in each Tolerance Map. This is because there are tolerance zones floating inside other tolerance zones (sub-zone). Submaps correspond to subzones." Claim 1 does not mention subzones. Claim 1 merely states "submaps of said stored maps", implying that the submaps are derived from the maps.

25. Remarks page 13 also defines "accumulation maps and functional maps, the former is the accumulation of individual Tolerance Maps and the latter is obtained directly for a single feature". This clear terminology (accumulation map versus functional map) clarifies the ambiguity of the general term "tolerance map". However, claim 1 does not use said clear terminology, but only uses the ambiguous terminology "tolerance map".

26. To summarize, Applicant's remarks both clarify and cloud the interpretation of claim 1. First, Applicant attempts to introduce additional complexity into claim 1 by discussing the terms stackups and subzones. Second, Applicant presents some clear terminology (accumulation map versus functional map), and said terminology clearly highlights the indefinite ambiguity of the claim 1 term "tolerance map".

27. 35 USC 102b REJECTIONS. Remarks page 16 states that Iannuzzi "does not consider the issue of accumulation at all". However, Iannuzzi states "The relationships and degrees of freedom are interpreted to determine if the tolerance plan defined by the designer is complete and well formed". The believes that one of ordinary skill in the art would interpret the Iannuzzi term "tolerance plan... complete and well formed" as disclosing accumulation/stackup tolerance analysis. Additionally, note that claim 1 (currently amended) similarly never explicitly discusses accumulation/stackup.

28. Remarks page 17 states that Iannuzzi "does not disclose a mathematical method (for instance, minimizing unused volume) as a means to optimize allocation of tolerances". However, claim 1 does not use the terms "mathematical method" or "minimizing unused volume".

Rather, claim 1 merely states "optimize", which appears disclosed by the Iannuzzi term "well formed".

29. 35 USC 103 REJECTIONS. The Examiner agrees that Maxey does not disclose all of the limitations in claim 24. However, Maxey in combination with Applicant's admitted commercial software packages does disclose all of the limitations.

35 USC § 112-Second Paragraph-indefinite claims

30. The following is a quotation of the second paragraph of 35 U.S.C. 112: The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

31. **Claims 1-12, 16-19, 21-23, and 25-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite** for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

32. In claim 1 (currently amended) the term **"interdependencies between said stored maps and interdependencies between submaps of stored maps"** is not clear. Specifically, Remarks page 13 states "Submaps correspond to subzones", but no such subzones are discussed in claim 1. Rather, claim 1 merely states "submaps of said stored maps", implying that the submaps are derived from the maps.

33. Further, claim 1 (currently amended) states "tolerance map". It is not clear whether said "tolerance map" refers to accumulation maps, or to functional maps, or to both. Remarks page 13 states "accumulation maps and functional maps, the former is the accumulation of individual Tolerance Maps and the latter is obtained directly for a single feature". This is particularly unclear because it appears that Applicant may intend that accumulations (stackups) be considered, per Remarks page 12. For comparison purposes, note that Kandikjan page 729 discusses "sub-graphs" for "dimensioning and tolerancing validation".

34. Claims 2-12, 16-19, 21-23, and 25-28) depend from claim 1 (currently amended) and are rejected for the same reasons.

Claim Rejections - 35 USC § 102(b)

35. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action: A person shall be entitled to a patent unless − (b) the invention was patented or described in a printed publication in this or a foreign country

or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

36. **Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated.**

37. <u>Claim 1 (currently amended) is rejected</u> under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.

38. Claim 1 (currently amended) is an independent claim with 4 limitations

39. **A-representing tolerance zone for each geometric feature of said object by a model with an algebraic form and a geometric form, wherein the geometric form is represented as a tolerance map** is disclosed by Iannuzzi at abstract "input of geometric data representing features of a manufactured part and data representing datums and tolerances for the features".

40. **B-computing... interdependencies between said stored maps and interdependencies between submaps of said stored maps to determine how different tolerance zones for said geometric feature affect each other and to determine how different tolerance zones for different geometric features of said object affect each other**

41. is disclosed by Iannuzzi at abstract "Relationships are established between the data and degrees of freedom are determined for the part features and tolerances".

42. **C-determining how different tolerance zones for geometric features on different objects affect each other** is

43. is disclosed by Iannuzzi at abstract "Relationships are established between the data and degrees of freedom are determined for the part features and tolerances".

44. **D-selecting tolerance conditions for said object to optimize allocation of tolerances** is disclosed by Iannuzzi at abstract "determine if the tolerance plan defined by a designer is complete and well formed. If it is not, the designer may then revise the tolerance plan to provide for a more consistent and useful tolerancing plan resulting in higher quality, lower cost manufactured parts and assemblies".

Claim Rejections - 35 USC § 103

45. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action: (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

46. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

47. Determining the scope and contents of the prior art.

48. Ascertaining the differences between the prior art and the claims at issue.

49. Resolving the level of ordinary skill in the pertinent art.

50. Considering objective evidence present in the application indicating obviousness or nonobviousness.

51. **Claims 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable.**

52. <u>Claim 24 is rejected</u> under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admission (commercial software) in view of Maxey (AutoCAD).

53. Claim 24 is an independent claim with 10 limitations, A-J.

54. A-**geometry engine module E1** is disclosed by Applicant's Admission at specification page 18 "commercial software... a geometry engine (ACIS, e.g. parasolid or DesignBase)".

55. B-**constraint solver E2** is disclosed by Applicant's Admission at specification page 18 "commercial software... a constraint solver (e.g. D-Cubed DCM, 2D/3D, design sheet or MAPLE)".

56. C-**geometry definition system M1** is disclosed by Applicant's Admission at specification page 18 "commercial software... a geometry engine (ACIS, e.g. parasolid or DesignBase)". Note that specification page 45 states "The procedure for creating such a system from commercially available... is well known".

57. E-**tolerancing module M4** is disclosed by Applicant's Admission at specification page 18 "commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)".

58. H-**tolerance allocation module M6** is disclosed by Applicant's Admission at specification page 18 "commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)".

59. J-**statistical tolerance analysis package E2** is disclosed by Applicant's Admission at specification page 18 "commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)".

60. Applicant's Admission (commercial software) does not explicitly disclose the additional limitations.

61. D-**dimensioning module M2** is disclosed by Maxey page 227 "dimensioning mode".

62. F-**global visualization module M3** is disclosed by Maxey page 277 "dynamic view".

63. **G-a D&T [datum and targets] Schema Advisor module M5** is disclosed by Maxey page 675 "geometric dimensioning and tolerance control frames".

64. **I-local module visualization module M7** is disclosed by Maxey page 277 "dynamic view".

65. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Maxey to modify Applicant's Admission.

66. One of ordinary skill in the art would have been motivated to do this because Maxey (AutoCAD) serves as a modeling platform upon which to add commercial software modules for constraint, geometry, and tolerance.

Response to Amendments or new IDS-FINAL OFFICE ACTION

67. Applicant's amendments or new IDS necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Patentable material

68. At present, the Examiner believes that this application contains substantial potentially allowable material. Specifically, the specification discusses certain complex interactions between tolerances which are not disclosed in the prior art of record. However, the claims must be written clearly, and must comprise at least one of said complex interactions

69. Note that dependent claims 2-12, 16-19, 21-23, and 25-28 depend from claim 1, and have not been rejected against prior art, but have been rejected as indefinite for the same reasons as claim 1. If the indefiniteness of claim 1 is overcome, then said dependent claims will be reconsidered.
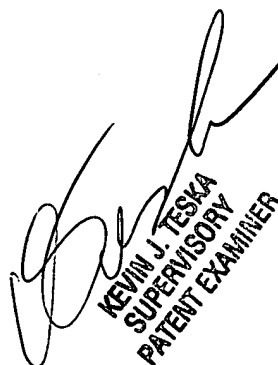
Conclusion

70. All claims stand rejected, and this action is final.

71. Claims 1-12, 16-19, 21-23, and 25-28are rejected under 35 U.S.C. 112.

72. Claim 1 is rejected under 35 USC 102(b).

73. Claim 24 rejected under 35 USC 103.

Communication

74. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 703-305-0857. The examiner can normally be reached on Monday through Thursday from 9:00 AM to 8:00 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kevin Teska, can be reached at (703) 305-9704. The fax phone number for this group is 703-872-9306.

75. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

* * * * *